

James P. Kercher, Ph.D.

Associate Professor of Chemistry
Chair, Chemistry Department
Department of Chemistry, Hiram College
11715 Garfield Rd. Hiram, OH 44234
Phone: 330.569.5259
Email: kercherjp@hiram.edu

Research Interests Atmospheric Chemistry: My research interests are in the areas of tropospheric halogen chemistry, nocturnal ozone and nitrogen oxide cycling reactions, and the atmospheric chemistry of environmental interfaces.

Unimolecular Dissociation Dynamics: Using a custom built time-of-flight mass spectrometer we study the energetics and reaction rates of unimolecular dissociations in the gas phase.

Education

University of North Carolina at Chapel Hill

Ph.D. in Physical Chemistry December, 2006

Research Advisor: Professor Tomas Baer

M.A. in Physical Chemistry May, 2004

Research Advisor: Professor Tomas Baer

Gettysburg College

B.S. in Chemistry May, 2002

Research Advisor: Professor Michael Wedlock

Academic Honors

Hiram College Martin Award for excellence in scholarship and service (2011)

Camille and Henry Dreyfus Postdoctoral Fellowship (2007 – 2009)

Gordon Research Conference Graduate Fellow (2005, 2006)

ASMS ASILOMAR Graduate Fellow (2006)

F.P. Venable Fellowship (University of North Carolina at Chapel Hill, 2002-2003)

Coblentz Society Student Award for Vibrational Spectroscopy (2001)

Presidential Scholar (Gettysburg College, 1998-2002)

Funded Grants

Gas Phase Ion Thermochemistry through Imaging Photoelectron Photoion Coincidence Spectroscopy, American Chemical Society Petroleum Research Fund - Undergraduate Research Award, \$70,000, 2017-2020, Principal Investigator.

Gas Phase Ion Dissociation Dynamics through Photoionization Mass Spectrometry, American Chemical Society Petroleum Research Fund - Undergraduate New Investigator Award, \$50,000, 2012-2014, Principal Investigator.

MRI: Acquisition of a Liquid Chromatography Electrospray Ionization (LC-ESI) Mass Spectrometer for Undergraduate Research, National Science Foundation, \$399,000, 2010-2013, Co-Principal Investigator. I contributed to the grant with a research proposal before arriving at Hiram College.

Research Experience

Camille and Henry Dreyfus Postdoctoral Fellow, Department of Atmospheric Science, University of Washington, Seattle, (June 2007 – June 2009)

Postdoctoral Associate, Department of Chemistry
University of North Carolina at Chapel Hill, (January – June 2007)

Ph.D. Dissertation Research (University of North Carolina at Chapel Hill)

On Parallel and Sequential Dissociations in Energy Selected Ions

M.A. Thesis Research (University of North Carolina at Chapel Hill)
A TPEPICO Study of Triethyl Phosphine and Various Dihalomethanes

Visiting Scientist, Department of General and Inorganic Chemistry
Eötvös Loránd University, Budapest, Hungary, May – July, 2005

**Field Research
Experience**

Western Atlantic Climate Study: Simultaneous detection of
nitryl chloride and dinitrogen pentoxide using Chemical Ionization Mass
Spectrometry, August 18th – 27th.

Energy and Environment – Uintah Basin Winter Ozone Study: Simultaneous
detection of nitryl chloride and dinitrogen pentoxide using Chemical Ionization Mass
Spectrometry, January 15th – March 1st, 2012.

Activation of Continental Chloride by Reactive Oxides of Nitrogen in wintertime
(ACCRONIM): Simultaneous detection of nitryl chloride and dinitrogen pentoxide
using Chemical Ionization Mass Spectrometry. Jan. 19th – Feb 12th, 2009.

International Chemistry Experiment of the Arctic Lower Troposphere
(ICEALOT): Simultaneous detection of nitryl chloride and dinitrogen pentoxide
using Chemical Ionization Mass Spectrometry. March 19th – April 24th, 2008.

**Unimolecular Dissociation Dynamics using the Swiss Light Source at the Paul
Scherrer Institut:** Investigation of unimolecular dissociation dynamics of energy-
selected ions using iPEPICO spectroscopy. Five (5) Hiram College undergraduate
students have conducted research at the SLS leading to 2 publications. 6 students will
be funded from 2018 - 2020.

**Teaching
Experience**

CHEM 101: Chemistry in Context (for non-majors)
CHEM 115: Introduction to Chemistry (for non-majors)
CHEM 120: Structure and Bonding (General Chemistry I)
CHEM 121: Introduction to Chemical Analysis (General Chemistry II)
CHEM 204: Physical Science in Everyday Thinking (for non-majors)
CHEM 230: Inorganic Chemistry
CHEM 350: Physical Chemistry I – Energetics
CHEM 351: Physical Chemistry II – Structure and Change
CHEM 381: Introduction to Atmospheric Chemistry (1 hour seminar 4 hour course)
CHEM 480: Chemistry Department Senior Seminar
CHEM 481: Independent Research
EVST 481: Independent Research
FSEM xxx: Going Green
MATH 197: Precalculus
PHYS 208: Introductory Electronics (laboratory section)

Service

Member of the Appointment, Promotion and Tenure Committee	2016 – Present
Chair of Chemistry	2016 – Present
Co-organizer of Undergraduate Summer Research Symposium	2010 – Present
Co-chair of HLC Subcommittee on Criterion 4	2017 – Present
Member of Health Sciences Board	2010 – 2017
Member of Council for Sustainability	2010 – 2015
Member of HHMI Grant Steering Committee	2011
Member of the Distance Learning Steering Committee	2011

Member of the Academic Program Committee	2013 – 2016
Member of the Assessment Committee	2013 – 2017
Faculty – Trustee Committee Representative for APC	2013 - 2015
Faculty Advisor for Habitat for Humanity	2011 – Present
Judicial Review Board	2016 - 2018

Publications

(Undergraduate authors
In Bold)

- [18] Krisztina Voronova, Krisztian G. Torma, James P. Kercher, Andras Bodi, and Balint Sztaray. *Dissociative Photionization of Chromium Hexacarbonyl: A Round-Trip Ticket to Non-Statisticality and a Detective Story in Thermochemistry*. Accepted, Int. J. Mass Spec. (2018).
- [17] Andras Bodi, Tomas Baer, **Nancy Wells, Daniel Fakhoury, David Klecyngier**, and James P. Kercher. *Tunnelling control and controlling tunnel in methane abstraction from acetone ions*. Phys. Chem. Chem. Phys., 17(43), 2015. *Selected to be the cover article for this issue.
- [16] James P. Kercher, Joel Thornton, Brian Lerner, Eric Williams, Patricia Quinn, Timothy Bates, Derek Coffman, William P. Dubé, Hendrik Fuchs and Steven S. Brown. *Observations of ClNO₂ and N₂O₅ in the Long Island Sound during the International Chemistry Experiment of the Arctic Lower Troposphere (ICEALOT) Field Campaign, 2008*. (In preparation).
- [15] **Eileen M. Russell, Elvis Cudjoe, Michael E. Mastromatteo**, James P. Kercher, Balint Sztaray, and Andras Bodi,. *From Iron Pentacarbonyl to the Iron Ion by Imaging Photoelectron Photoion Coincidence*. J. Phys. Chem. A., 117(22), 4556-4563, 2013. DOI: 10.1021/jp402443e.
- [14] P. M. Edwards, C. J. Young, K. Aikin, J. A. deGouw, W. P. Dubé, F. Geiger, J. B. Gilman, D. Helmig, J. S. Holloway, J.P. Kercher, B. Lerner, R. Martin, R. McLaren, D. D. Parrish, J. Peischl, J. M. Roberts, T. B. Ryerson, J. Thornton, C. Warneke, E. J. Williams, and S. S. Brown, *Ozone photochemistry in an oil and natural gas extraction region during winter: simulations of a snow-free season in the Uintah Basin, Utah*. Atmos. Chem. Phys. Discuss., 2013, 7503-7552.
- [13] Felipe D. Lopez-Hilfiker, **Kevin Constantin**, James P. Kercher and Joel A. Thornton. *Temperature Dependent Halogen Activation by N₂O₅ Reactions on Halide-Doped Ice Surface*. Atmos. Chem. Phys., 12, 5237 – 5247, 2012.
- [12] Joel A. Thornton, James P. Kercher, Theran P. Reidel, Nicholas L. Wagner, Julie Cozic, John S. Holloway, Willian P. Dube, Glenn M. Wolfe, Patricia K. Quinn, Ann M. Middlebrook, Becky Alexander, Steven S. Brown. *A large atomic chlorine source inferred from mid-continental reactive nitrogen chemistry*. Nature, 2010, 464, 271.
- [11] James P. Kercher, Theran P. Reidel, and Joel A. Thornton. *Chlorine Activation by N₂O₅: Simultaneous, In Situ Detection of ClNO₂ and N₂O₅ by Chemical Ionization Mass Spectrometry*. Atmos. Meas. Tech., 2009, 2, 1-12.
- [10] Nicholas Shuman, James P. Kercher, and Tomas Baer. *Modeling The Dissociation Dynamics of Energy-Selected Neopentylamine Ions: Heats of Formation of Neopentylamine and Neopentyl Alcohol* Int. J. Mass Spec. 2008, 278, 26-31.

- [9] James P. Kercher, Will Stevens, **Zsolt Gengeliczki**, and Tomas Baer. *Modeling Unimolecular Dissociations from a Temperature Controlled TPEPICO Study on 1-C₄H₉I⁺ Ions*. Int. J. Mass Spec. 2007, 267(1-3) 159-166.
- [8] James P. Kercher, **Zsolt Gengeliczki**, Bálint Sztáray, and Tomas Baer. *Dissociation Dynamics of Sequential Ionic Reactions: Heats of Formation of Tri-, Di-, and Monoethyl Phosphine Ions*. J. Phys. Chem. A, 2007, 111(1), 16-26.
- [7] Andras Bodi, James P. Kercher, **Curtis Bond**, **Patcharica Meteesatien**, Bálint Sztáray, and Tomas Baer. *Photoion Photoelectron Coincidence Spectroscopy of Primary Amines RCH₂NH₂ (R=H, CH₃, C₂H₅, C₃H₇, i-C₃H₇): Heats of Formation by Isodesmic Reaction Networks*. J. Phys. Chem. A, 2006, 110(50), 13425-13433.
- [6] James P. Kercher, Bálint Sztáray, and Tomas Baer. *On the Dissociation of the 2-Pentanone Ion Studied by Threshold Photoelectron Photoion Coincidence Spectroscopy*. Int. J. Mass Spec. 2006, 249, 403-411.
- [5] Tomas Baer, Bálint Sztáray, James P. Kercher, A.F. Lago, Andras Bodi, **Christopher Scull**, and **Don Palathinkal**. *Threshold Photoelectron Photoion Coincidence Studies of Parallel and Sequential Reactions*. Phys. Chem. Chem. Phys. 2005, 7(7), 1507-1513.
- [4] A.F. Lago, James P. Kercher, Andras Bodi, Brad Miller, **Dan Wurzleman**, and Tomas Baer. *Dissociative Photoionization and Thermochemistry of Dihalomethane Compounds Studied by Threshold Photoelectron Photoion Coincidence Spectroscopy*. J. Phys. Chem. A, 2005, 109(9), 1802-1809.
- [3] James P. Kercher, Elizabeth A. Fogleman, Hideya Koizumi, Bálint Sztáray, and Tomas Baer. *The Heats of Formation of the Propionyl Ion and Radical and 2,3-Pentanedione by Threshold Photoelectron Photoion Spectroscopy*. J. Phys. Chem. A, 2005, 109(5), 939-946.
- [2] Andras Bodi, James P. Kercher, Bálint Sztáray, and Tomas Baer. *On The Mechanism of Parallel Dissociation in Energy-Selected P(CH₃)₃⁺ Ions*. J. Phys. Chem. B, 2005, 109(17), 8393-8399.
- [1] Elizabeth A. Fogleman, Hideya Koizumi, James P. Kercher, Bálint Sztáray, and Tomas Baer. *Heats of Formation of the Acetyl Radical and Ion Obtained by Threshold Photoelectron Photoion Coincidence Spectroscopy*. J. Phys. Chem. A, 2004, 108(24), 5288-5294.

Select Presentations
(Undergraduate authors
in bold)

Patrick R. Veres, James M. Roberts, Bin Yuan, Peter Edwards, Rob Wild, Steven Brown, Tim S. Bates, Patricia Quinn, Rob McLaren, James P. Kercher, Joel Thornton, Eric Williams, Joost de Gouw, Carsten Warneke, John Holloway, *Measurements of Nitryl Chloride and Acyl Peroxynitrates (PANs) in the Uintah Basin, Utah during the 2012 and 2013 Uintah Basin Winter Ozone Study (UBWOS 2012, 2013)*, American Geophysical Union Fall Meeting, San Francisco, CA, December 9th - 13th, 2013.

James M. Roberts, Yuan Bin, Patrick Veres, Carsten Warneke, Joost A. de Gouw, Felix Geiger, Steven S. Brown, Peter M. Edwards, Robert Wild, Kyun-Eun Min, Timothy Bates, Patricia Quinn, Robert M. Banta, Robert Zamora, Robert

McLaren, Cora Young, James P. Kercher, Joel Thornton, Eric Williams, *Radical Sources in the Uintah Basin during 2013 Winter Ozone Episodes*, American Geophysical Union Fall Meeting, San Francisco, CA, December 9th - 13th, 2013.

P. M. Edwards, K. Aikin, J. deGouw, W. P. Dubé, F. Geiger, J. Gilman, D. Helmig, J. S. Holloway, J. Kercher, A. Koss, B. Lerner, R. Martin, R. McLaren, K. Min, D. D. Parrish, J. Peischl, J. M. Roberts, T. B. Ryerson, J. Thornton, P. Veres, C. Warneke, R. Wild, E. J. Williams, C. J. Young, B. Yuan, S. S. Brown, *Sensitivities of winter ozone pollution events in oil and gas producing regions to VOCs, NO_x and radicals*, American Geophysical Union Fall Meeting, San Francisco, CA, December 9th - 13th, 2013.

R. J. Wild, R. C. Cohen, W. P. Dube, P. M. Edwards, J. Holloway, J. Kercher, L. Lee, R. McLaren, J. M. Roberts, J. Stutz, P.R. Veres, C. Warneke, E. J. Williams, B. Yuan, S. S. Brown, *Reactive Nitrogen Partitioning and its Relationship to Winter Ozone Events in Utah*, American Geophysical Union Fall Meeting, San Francisco, CA, December 9th - 13th, 2013.

James P. Kercher, **Eileen M. Russell**, **Elvis Cudjoe**, **Michael Mastromatteo**, Balint Sztaray, and Andras Bodi, *From Iron Pentacarbonyl to the Iron Ion by Imaging Photoelectron Photoion Coincidence*, ETH – Zurich, Sept. 11th – 13th, 2013.

Nancy Wells, James P. Kercher, **Daniel Fakhoury**, **David Klecyngier**, Tomas Baer, and Andras Bodi, *Infinitely large kinetic isotope effect in parallel dissociation reactions of acetone-h₆ and acetone-d₆ cations*, ETH – Zurich, Sept. 11th – 13th, 2013.

James P. Kercher. *Breaking and Making Bonds: An Undergraduate Research Program in Physical Chemistry*, Hiram College, Sept. 18th, 2013.

James P. Kercher, *From the North Atlantic to Boulder, CO: Chlorine Activation by Reactive Oxides of Nitrogen*, York University, September 25th, 2012.

James P. Kercher, *From Tromso to Boulder: Chlorine Activation by Reactive Oxides of Nitrogen*, University of the Pacific, April 24th, 2012.

James P. Kercher, *From Tromso to Boulder: Chlorine Activation by Reactive Oxides of Nitrogen*, Paul Scherer Institute, Villigen, Switzerland, May 3rd, 2011.

James P. Kercher, *Why would you build a mass spectrometer anyway?*, Hiram College Library Forum, Hiram College, October 27th, 2010.

Theran P. Reidel, Joel A. Thornton, James P. Kercher, Nicholas Wagner, William P. Dubé, Julia Cozic, John Holloway, Glenn M. Wolfe, Patricia K. Quinn, Ann Middlebrook, and Steven S. Brown, *Observationally constrained estimates of nitryl chloride production on a regional and global scale*, American Geophysical Union Fall Meeting, December 14-18, 2009.

Nicholas Wagner, William P. Dubé, James P. Kercher, Joel A. Thornton, Julie Cozic, John Holloway, Glenn M. Wolfe, Patricia K. Quinn, Ann M. Middlebrook, and Steven S. Brown, *A Study of Mid-continent halogen activation: Wintertime*

measurements of N₂O₅ and ClNO₂, American Geophysical Union Fall Meeting, December 14-18, 2009.

Joel A. Thornton, James P. Kercher, Theran P. Reidel, Nicholas Wagner, William P. Dube, Julie Cozic, John Holloway, Glenn M. Wolfe, Patricia K. Quinn, Ann M. Middlebrook, and Steve S. Brown, *From Tromso to Boulder: the global importance of ClNO₂ as a chlorine atom source*. American Geophysical Union Fall Meeting, December 14-18, 2009.

James P. Kercher, Joel A. Thornton, Brian Lerner, Eric Williams, Patricia K. Quinn, Timothy Bates, Derek Coffman, William P. Dubé, Hendrik Fuchs, and Steven S. Brown, *Observations of ClNO₂, N₂O₅ and Cl₂ off the Northeastern United States Coast*, American Geophysical Union Fall Meeting, December, 2008

James P. Kercher and Joel Thornton, *Halogen Activation by N₂O₅ Reaction on Sea Ice Surfaces*, American Geophysical Union Fall Meeting, December, 2007.

James P. Kercher and Tomas Baer, *Modeling Unimolecular Dissociations from a Temperature Controlled TPEPICO Study on 1-C₄H₉I⁺ Ions*, Gordon Research Conference on Gaseous Ions: Structures, Energetics and Reactions, 2007.

Andras Bodi, James P. Kercher, Bálint Sztáray, and Tomas Baer, *Alkyl Amine and Alkyl Radical Heats of Formation by PEPICO Spectroscopy and Isodesmic Reaction Networks*, Gordon Research Conference on Gaseous Ions: Structures, Energetics and Reactions, 2007.

James P. Kercher, Zsolt Gengeliczki, Bálint Sztáray, and Tomas Baer, *Dissociation Dynamics of Sequential Ionic Reactions in Energy Selected Ions*, ASMS ASILOMAR Conference on Mass Spectrometry, 2006.

James P. Kercher, Zsolt Gengeliczki, Bálint Sztáray, and Tomas Baer, *Dissociation Dynamics of Sequential Ionic Reactions in Energy Selected Ions*, Gordon Research Conference on Photoions, Photoionization and Photodetachment, 2006.

James P. Kercher, Bálint Sztáray, and Tomas Baer, *On the Dissociation of the 2-Pentanone Ion by TPEPICO Spectroscopy*, Gordon Research Conference on Photoions, Photoionization and Photodetachment, 2006.

James P. Kercher, *Thermochemistry of Unstable Species: A Road to Bond Energies*, Departmental Seminar, University of North Carolina at Chapel Hill, 2005

Hideya Koizumi, James P. Kercher, Elizabeth Fogleman, Bálint Sztáray, and Tomas Baer, *The Heats of Formation of the Propionyl Ion and Radical and 2,3-Pentanedione by TPEPICO Spectroscopy*, Gordon Research Conference on Gaseous Ions: Structures, Energetics and Reactions, 2005.

Andras Bodi, James P. Kercher, Bálint Sztáray, and Tomas Baer, *On the Parallel Mechanism of the Dissociation of Energy-Selected P(CH₃)₃⁺ Ions*, Gordon Research Conference on Gaseous Ions: Structures, Energetics and Reactions, 2005.

James P. Kercher, Zsolt Gengeliczki, Bálint Sztáray, and Tomas Baer, *Dissociation Dynamics of Energy-Selected Alkyl Phosphine Ions*, Gordon Research Conference on Gaseous Ions: Structures, Energetics and Reactions, 2005.

James P. Kercher, Bálint Sztáray, and Tomas Baer, *Threshold Photoelectron Spectroscopy using Velocity Focusing Optics*, 59th Ohio State International Symposium on Molecular Spectroscopy, 2004.

Hideya Koizumi, James P. Kercher, Elizabeth A. Fogleman, Bálint Sztáray, and Tomas Baer, *Heats of Formation of the Acetyl and Propionyl Ions and Radicals with TPEPICO Spectroscopy*, 228th ACS National Meeting, 2004